**Kenya Certificate of Secondary Education 2019**

**231/3 Physics Paper 3**

**(Practical)**

 **END TERM 1 - Time: 2 ½ hrs**

**Name …………………………………………….……… Index Number…………………………..**

**Candidate’s Signature ………………….…...……….. Date ……………………………………**

1. **INSTRUCTIONS TO CANDIDATES**
2. Write **your name** and **index number** in the spaces provided
3. Answer **ALL** the questions in the spaces provided in the question paper.
4. You are supposed to spend the first 15 minutes of the 2 1/4 hours allowed for this paper reading the whole paper carefully before commencing your work.
5. Marks are given for clear record of observations made, their suitability, accuracy and the use made of them.
6. Candidates are advised to record their observations as soon as they are made.
7. **Non-programmable** silent electronic calculators and KNEC mathematical table may be used.
8. **This paper consists of 6 printed pages. Candidates should check to ensure that all pages are printed as indicated and no questions are missing**

**FOR EXERMINER’S USE ONLY.**

 **Question 1.**

|  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |
| **Maximum score** |  |  |  |  |  |  |
| **Candidate’s score** |  |  |  |  |  |  |

 **Total
 Question 2**

|  |  |  |  |  |  |  |
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| **Maximum score** |  |  |  |  |  |  |
| **Candidate’s score** |  |  |  |  |  |  |

 **Total**

Turn over

 **@ 2019**

**1.** You are provided with the following :

 - One stand

 - One boss

 - One clamp

 - Two pieces of thread

 - One stopwatch

 - One metre rule or half metre rule

 - Two springs.

 - Six 100g masses

 - A piece of cellotape.



a)

 a) i) Hang the springs from rod of a clamp as shown in the figure above.

 ii) Tie together the upper end and the lower ends to springs with pieces of thread as shown in the figure.

 iii) Hang a 100g mass from the lower ends of he springs so that the mass is supported by both springs.

 iv) Clamp the rule vertically with zero centimetre mark uppermost.

 v) Use cellotape to fix the optical pin on the top of the 100g mass so that it acts as a pointer.

 vi) Adjust the rule so that the pointer is at 40.0cm mark from the top of the rule.

b) i) Add a 100g mass to the first mass. Record the new position of the pointer and the extension, e, in the table below.

 ii) Add another 100g mass and record the new position of the pointer and the extension in the table.

 iii) Repeat b(ii) until the total mass supported by the spring is 600g.

c) i) Remove the rule. Displace the 600g mass slightly downwards and release it to oscillate vertically.

 ii) Time 20 oscillations. Record in the table the time, t1 for 20 oscillations. Repeat this to obtain the average time, t, and the

 period of oscillation T.

 iii) Repeat (c) (i) and (ii) for 500g, 400g 300g and 200g masses.

 iv) Find T² and complete the table.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Mass (g)** | 100 | 200 | 300 | 400 | 500 | 600 |
| **Position of point (cm)** | 40.0 |  |  |  |  |  |
| **Extension, e, cm** | 0.0 |  |  |  |  |  |
| **Time of t, (s)** |  |  |  |  |  |  |
| **20 oscillations t2(S)** |  |  |  |  |  |  |
| **Average time, t(s)** |  |  |  |  |  |  |
| **Periodic time, T(s)** |  |  |  |  |  |  |
| **T²(S²)** |  |  |  |  |  |  |

d) i) On the grid provided plot a graph of T²(vertical axis) against the extension, e. (5 marks)



d) ii Determine the gradient of the graph. (2 marks)

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 iii) The equation of the graph is given by



 Where b and c are constants.

 Determine the value of b. (1 mark)

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 What does the value of b represent? (1 mark)

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**2.** PART A

 You are provided with the following apparatus.

- Two dry cells.

- Nichrome wire mounted on a mm scale.

- An ammeter.

- Cell holder.

- Voltmeter

- 8 connecting wires.

- Metre rule

- Switch.

 Proceed

a) Connect the circuit as shown in the diagram below.



b) Connect the end A and C where AC is 100cm across the terminals as shown. Close the switch and measure both current I and p.d. across the wire AC.

 Current = I .......................................................................................................................... (½ mark)

 P.d V = ................................................................................................................................. (½ mark)

c) Measure the emf of the cells E = ........................................................................................ (½ mark)

d) Reduce the length AC. In each case record the current I and the corresponding V. Complete the table below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Length L(cm)** | **100** | **70** | **60** | **50** | **40** | **20** |
| **Current I (A)** |  |  |  |  |  |  |
| **P.d. (V)** |  |  |  |  |  |  |
| **E - V (v)** |  |  |  |  |  |  |

e) Plot a graph of (E - V) against I (A) (5 marks)



f) Determine the slope of the graph. (2 marks)

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g) Given that E = V + 1r determine r from your graph. (1½ marks)

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 **Que 2 PART B**

 You are provided with the following apparatus.

* Rectangular glass block
* 3 optical pins
* A soft board.
* A plane paper
* 4 paper pins.

 Place the rectangular glass block in the middle of the plane paper and trace its outline. Using a pencil remove the block.



 Construct a perpendicular line LMO bisecting the shorter sides of M and O.

 Mark points P and Q such that PM = MQ = 5cm.

a) Measure (1 mark)

 OM...............................................................................................

- Place the plane paper on the soft board and carefully replace the glass block so that it fit the outline.

- Press the object pin on O such that it is upright and touching glass block and the second pin on P also upright and touching the block.

- Press the third pin P1 a short distance form the block such that P1, P and I lie on a straight line when viewed through the block with one eye. I is the image of the object pin O.

- Repeat the experiment with now on Q. Press the third pin P² a short distance from the block such that when viewed P², Q and I lie in a straight line.

b) Remove the pins and glass block; draw the lines P1PI (PI dotted) and P2 QI (QI) doted meeting OM at I.

 IM = ..........................................................................................................cm (1 mark)

c) Using the above information calculate the refractive index of the glass block by real and apparent depth method. (2 marks)

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**d) NB - Hand in your work on the plane paper. (1 mark)**

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